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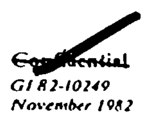
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Soviet Wheat Variety Development: Trends and Prospects

A Technical Intelligence Report

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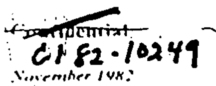
Soviet Wheat Variety Development: Trends and Prospects

Overview

Information available as of 14 September 1982 was used in this report.

We estimate that the USSR could reduce its annual wheat losses from insects, diseases, and lodging by some 10 to 20 million tons within the next 10 years through the development and planting of genetically improved wheat varieties. To achieve this reduction, the Soviets must overcome numerous shortcomings that have plagued their wheat development program—such as the failure to be innovative, to practice interdisciplinary teamwork, and to apply research findings to production. Despite limited progress to date, the Soviet wheat-breeding program has great potential. It appears to be well funded, and is centered in some excellent research facilities.

Soviet wheat varieties currently possess a high degree of genetic uniformity. Three varieties have predominated since the 1960s: 90 percent of all winter wheat is sown with varieties containing the germ plasm of at least one of two varieties, and 60 percent of the spring wheat area is sown with varieties containing the germ plasm of a single variety. The resulting narrow genetic base over the years has led to excessive losses from diseases, insects, and unusually severe weather.


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Introduction

The Soviet Union is the world's largest producer of wheat, accounting for about one-fourth of total world output. Wheat constitutes about 50 percent of total Soviet grain production and nearly 90 percent of total foodgrain production. It is planted on about 60 million hectares, almost 50 percent of the Soviet grain growing area. Although Soviet farmers regularly produce enough wheat to meet the country's needs for bread and other wheat products for human consumption, efforts to upgrade diets by providing more meat have boosted the requirement for feedgrain, including wheat used for feed, well beyond the amount that can be reliably produced. In recent years as much as 40 percent of the total wheat crop has been used as livestock feed. Shortfalls in total grain output are covered by costly imports from the West; in the marketing year ending 30 June 1983 the bill for some 45 million tons of grain will amount to $5-5.5 billion.

The problem created by the rising demand for feedgrains is compounded by wide year-to-year fluctuations in wheat production because of environmental conditions that, in general, do not favor agriculture and by the failure to develop and apply appropriate agrotechnology, as well as by managerial and organizational problems. A major aspect of the technology problem is the failure to develop new wheat varieties. Varietal improvements have the potential to increase Soviet wheat yields and production significantly.

Strengths of the Soviet Wheat-Breeding Program

Work on the Soviet wheat-breeding program is carried out at nearly 50 installations, according to published Soviet accounts. At least a dozen of these establishments are relatively large. Those at Krasnodar, Mironovka, and Odessa, for example, are extensive complexes that include numerous greenhouses, laboratory and seed storage buildings, housing facilities, and phytotrons—controlled-climate facilities. The phytotron that was completed in 1978 at the All-Union Selection and Genetics Research Institute in Odessa is probably the largest in the world.

In addition to the phytotrons, found only at the larger research centers, according to [redacted] almost all Soviet wheat-breeding establishments now have controlled-growth chambers, primarily of Canadian and US designs purchased during the 1970s. Three crop generations per year can be grown in many of the larger installations, which allows accelerated development and introduction of new varieties.

The Soviet breeding program also maintains a germplasm collection that includes some 40,000 wheat specimens, probably the largest collection in the world. The collection provides Soviet wheat breeders with the potential to utilize any of the world's wheat genetic resources. A modern national facility for storage and maintenance of crop germ plasm was built near Krasnodar in 1975.

Shortcomings[1]

The Soviet wheat-breeding program, despite its potential, has a number of shortcomings, including a serious lag in the application of research findings. Soviet plant breeders tend to shy away from innovation and the interdisciplinary teamwork necessary to develop new, high-yielding, disease- and insect-resistant varieties. Soviet scientific literature and [redacted] indicate that Soviet wheat breeding is frequently based on the use of a limited number of long-known and conventional methods. Many Soviet wheat-breeding efforts involve only 100 to 150 two-parent crosses per year, compared to the 500 to 3,000 crosses that are made in major US programs.

[1] The discussion of this topic and the remainder of the report are based on an analysis of Soviet annual reports on newly zoned varieties from 1976 through 1982, extensive examination of Soviet wheat-breeding literature published since 1975, and [redacted]

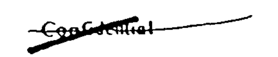
Table 1
Sown Area of Major Winter Wheat Varieties by Originating Breeding Center, 1977

Varieties by Facilities of Origin	USSR		RSFSR		Ukraine	
	1,000 Hectares	Percent of Area Sown	1,000 Hectares	Percent of Area Sown	1,000 Hectares	Percent of Area Sown
Totals	15,392	90.5	9,309	98.1	3,793	84.5
Mironovka NII of Selection and Seedgrowing	7,804	45.9	5,464	57.6	1,759	38.90
Krasnodar NII of Agriculture	5,453	32.0	2,910	30.7	1,058	23.40
All-Union Selection-Genetic Institute	1,647	9.7	450	4.7	973	21.50
Zernogradka State Selection Station	488	2.9	485	5.1	3	0.70

Soviet breeders, furthermore, appear not to be taking practical advantage of recent Soviet and worldwide achievements in wheat genetics and cytogenetics. For example, biochemical and molecular genetic approaches to breeding are not in widespread use in the USSR. Also, plant breeders generally have not worked closely enough with plant pathologists and entomologists. As a result, both old and new wheat varieties are insufficiently resistant to disease and insects

Predominance of a Few Breeding Centers. In 1977 more than 90 percent of the sown winter wheat area was planted with varieties developed by only four Soviet breeding centers (table 1). The directors of breeding activities at these centers have dominated the Soviet winter wheat breeding program for the past quarter of a century. The breeding of spring wheat is similarly concentrated. Approximately 70 percent of the spring wheat area is sown with varieties developed by only three centers. Of these, the Scientific-Research Institute of Agriculture for the Southeast (S. P. Shekhurdin) is by far the most important. From 1973 to 1980, 28.6 to 29.6 million hectares—nearly 68 percent of the spring wheat area—was planted with varieties developed by this institute alone. Of considerably less importance are the Siberian Scientific-Research Institute of Agriculture and the All-Union Scientific-Research Institute of Grain Economy. Varieties developed by these two centers and by other smaller institutes normally account for plantings of less than 1 million hectares each

The dominance of a few wheat-breeding centers in the USSR has seriously reduced the genetic variability (increased the genetic uniformity) of the planted wheat crop. Moreover, Soviet annual published reports on newly zoned varieties show that wheat breeders at other institutes, rather than attempting to challenge the dominant centers, have concentrated primarily on the development of varieties that are more narrowly adapted to local conditions. This has permitted the dominant centers to become entrenched and to exert undue authority, power, and influence over the direction of Soviet wheat-breeding research. The Mironovka Center, for example, which is also the head institute for winter wheat breeding, still perpetuates and promotes in national publications, and even in various international forums, the virtues of the "transformation" of spring wheat into winter wheat a hangover from the generally discredited Lysenko era. Furthermore, we believe that the dominance and prestige of a few favored wheat-breeding institutes have largely eliminated competitiveness, independent thinking, and original research, thereby fostering continuing reliance on proven but older varieties of wheat as major sources of the germ plasm used in Soviet breeding programs



Genetic Diversity. In recent published discussions of the wheat-breeding program, Soviet breeders have begun to recognize that the use of only a few sources of genes can lead to undesirable results. They also admit that wheat varieties now under cultivation are not able to cope satisfactorily with cold and drought and with rusts and other diseases. Furthermore, they are aware that to obtain high and stable yields it is necesssary to have a wide spectrum of diverse high-yielding, adaptable, and disease-resistant varieties of wheat, but as yet they have not shaped their wheat-breedin- -rogram to deal with these and associated issues

When publicizing their wheat-breeding accomplishments, the Soviets frequently call attention to the number of wheat varieties they have developed. For example, they point out that during the 10th Five-Year Plan, 31 to 36 new varieties of winter wheat and some 38 new varieties of spring wheat were approved and zoned for planting.[2] The new varieties were chosen from 173 winter and 107 spring wheat candidate varieties that had been developed and evaluated. Such publicity often leads non-Soviet wheat breeders and other foreign agricultural specialists to conclude that there is considerable genetic diversity in wheat that is grown in the USSR, but that is not the case

The genetic base of the predominant Soviet wheat varieties *is very narrow*. The four leading winter wheats, ranked according to percentage of the total sown area that they occupied in 1980, are listed in table 2. Soviet calculations show that winter wheat grown on 90 to 95 percent of the winter wheat area in 1979 and 1980 contained the germ plasm of one or both of two varieties, Bezostaya 1 and Mironovskaya 808. We estimate that some 60 percent of common spring wheat now grown in the USSR includes the germ plasm from one variety, Saratovskaya 29, and that about 80 to 90 percent of the spring durum wheat is produced by only one variety, Kharkovskaya 46.

[2] A zoned variety is one that has been approved for commercial growing in one or more regions of the USSR by the State Commission for Variety Testing. Before entering state testing, a prospective variety must undergo at least three years of competitive testing at the originating center. If tests are satisfactory, the variety is subjected to three years of testing within the State Variety Testing system. If this testing is successful, the variety is approved by the Commission, wh[illegible] then recommends the zones or oblasts where it is to be grown

Table 2
Major Winter Wheat Varieties by Sown Area, 1980

Ranking	Variety	Derivation	Percent of Winter Wheat Area
	Total		About 70
1	Mironovskaya 808	Selection from Artemovka	More than 25
2	Bezostaya 1	Selection from Bezostaya 4	Slightly less than 25
3	Odesskaya 51	(Bezostaya 4 x Odesskaya 16)	About 14
4	Severodonskaya	(Bezostaya 1 x Mironovskaya 808)	6 to 7

During the period of 1972-82, the Soviets zoned a total of 93 new varieties of wheat. Three-fourths of these varieties contained the germ plasm of at least one of three varieties Bezostaya 1, Mironovskaya 808, and Saratovskaya 29. These three varieties and varieties derived from them occupied nearly all of the total whe-- area of the USSR from 1972 through 1982

Genetic Vulnerability. From the mid-1960s to the mid-1970s, more than 80 percent of the winter wheat area was sown to two varieties—Bezostaya 1 and Mironovskaya 808 (table 3). For spring wheat, the long-term dominance of a single variety over the total sown area has been about 40 percent—except in the vast area of the New Lands, where it has been extremely high. For example, about 95 percent of the spring wheat area in Kazakhstan in 19-- --- sown to the Saratovskaya 29 variety (table 4

The threat of genetic vulnerability most often is reduced by increasing the number and genetic diversity of predominant varieties at any given time; however, vulnerability can also be reduced by regularly replacing leading varieties with others that differ slightly in genetic makeup, particularly in terms of resistance to diseases and insects. Such a practice provides "time diversity," whereby the buildup of

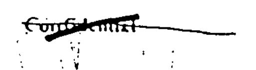




Table 3
Dominance of the Winter Wheat Varieties Bezostaya 1, Mironovskaya 808, and Their Derivative Varieties According to Sown Area

Year	Variety or Variety Grouping	Percent of Winter Wheat Area
1968	Bezostaya 1	42
	Mironovskaya 808	42
	Total	84
1973	Bezostaya 1	40
	Mironovskaya 808	45
	Total	85
1977-79 [a]	Bezostaya 1 plus three derivative varieties (Kavkaz, Krasnodarskaya 39, and 46)	33.4
	Mironovskaya 808 plus two derivative varieties (Mironovskaya Jubilee and Ilichevka)	33-36
	Total	66.4-69.4
1980	Bezostaya 1 and Mironovskaya 808 plus all derivative varieties	90-95

[a] Ilichevka, Kavkaz, Severodonskaya, Rostovchanka (Bezostaya 1 x Mironovskaya 808) Krasnodarskaya 46, Odesskaya 51, Priboy (Bezostaya 1 x Odesskaya 16) Krasnodarskaya 39 (Bezostaya 1 x Saratovskaya 3) Donskaya Ostistaya (Bezostaya 1 x Local 272/59) Dneprovskaya 521 (Bezostaya 1 x Ukrainka x Elimus) Dneprovskaya 775 (Bezostaya 1 x Lutescens 230) Mironovskaya Jubilee (Mironovskaya 808 x Bezostaya 4) constituted 32 percent of the winter wheat area in 1977.

Table 4
Dominance of the Spring Wheat Variety, Saratovskaya 29, According to Sown Area

Year	Percent of Spring Wheat Area, Including Durum	Percent of Spring Wheat Area, Excluding Durum
1970	38	46 (estimated)
1973	40	43 (estimated)
1970-76	45 (estimated average)	
1980	40 (estimated)	
1975-80	96 percent of spring wheat in Kazakhstan	

populations of specific strains of diseases or insects capable of attacking a particular variety is reduced. In the United States most of the leading varieties of wheat are grown extensively for only about six to eight years. By contrast, the three leading Soviet wheat varieties have been grown extensively for at least the past 15 years. A more detailed discussion of the vulnerability of Soviet wheat varieties can be found in appendix A

Varietal Weaknesses

The yield potential of many Soviet varieties is not being realized because of varietal weaknesses. Diseases and pests injure plants by reducing biological productivity and by causing direct losses during or after the formation of grain kernels. Lodging [3] limits the benefits of fertilizer and clean fallow, reduces harvest efficiency, and increases yield losses in terms of unfilled grain kernels, unharvested grain, and spoiled or sprouted grain. Winterkill reduces the density of stand and the number of vigorous plants. Drought results in poor vegetative growth and reduced filling or formation of the grain kernels. That Soviet wheat breeders have failed to develop varieties of wheat capable of coping with these problems is illustrated in part by table 5, which categorizes the resistance of wheat grown in the Ukraine to the most widespread diseases and insect pests.

Disease Problems. The Soviets estimate that the value of annual grain losses caused by diseases is billions of rubles. We estimate that losses due to rust diseases alone average about 6 percent of the potential total wheat crop, and in epiphytotic years at least 10 to 15 percent (figure 1). Most varieties of winter wheat are susceptible to leaf, stem, and stripe rust diseases. Leaf rust is always present in the major Soviet winter wheat areas, and some losses in yield occur almost every year. In years of rust epiphytotics, losses of 20 percent or more can occur.[4] Major epiphytotics of leaf

[3] Lodging is a condition whereby wheat stems lean, bend, or break resulting in a flattened and sometimes tangled mass that is difficult to harve

[4] An epiphytotic is the sudden and destructive development of a plant disease, usually involving an extensive area. It corresponds to an epidemic of a human disease

Table 5
Resistance of Selected Zoned Soviet Varieties of Winter and Spring Wheat to the Most Widely Occurring Diseases and Pests [a]

Variety	Disease								Insect Pest				
	Stem Rust	Leaf Rust	Stripe Rust	Powdery Mildew	Septoria Disease	Scab	Smut (Bunt)	Loose Smut	Hessian Fly	Frit Fly	Wheat or Spring Fly	Sawflies	Sunn Bug (Eurygaster integriceps)
Winter wheat													
Mironovskaya 808	MS	S	MS	R	R	MS	S	MS	MS	MS	MS	MS	MS
Bezostaya 1	MS	MS	MS	S	S	S	S	MS	MS	MS	MS	MS	MS
Odesskaya 51	S	S	MS	MS	MS	MS	S	MS	S	S	S	MS	MS
Priboy	S	MS	MS	MS	MS	MS	S	MS	S	S	S	MS	MS
Ilichevka	MS	MS	MS	MS	MS	MS	MS	MS	S	S	S	MS	MS
Polesskaya 70	MS	MS	MS	MS	S	MS	S	MS	S	S	S	MS	MS
Kavkaz	R	S	R	S	S	S	S	MS	S	S	S	MS	MS
Dneprovskaya 521	S	S	MS	S	S	S	S	MS	MS	MS	MS	MS	MS
Dneprovskaya 775	S	S	MS	S	S	S	MS	MS	MS	R	MS	MS	MS
Kharkovskaya 63	S	S	MS	S	MS	S	S	MS	MS	MS	MS	MS	MS
Veselopodolyanskaya 485	S	S	S	S	S	MS	S	MS	MS	MS	MS	MS	MS
Odesskaya Yubileynaya	S	MS	S	R	S	MS	R	MS	MS	MS	MS	R	MS
Novomichurinka	S	MS	S	R	S	MS	R	MS	MS	MS	MS	R	MS
Spring wheat													
Saratovskaya 29	S	MS	MS	R	S	MS	MS	R	MS	MS	MS	MS	MS
Kharkovskaya 93	S	MS	MS	R	S	MS	MS	R	MS	MS	MS	MS	MS
Rovenskaya	S	MS	S	S	MS	MS	MS	MS	MS	MS	MS	MS	MS
Lyutestsens 491	S	MS	S	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
Dublyanka 4	S	MS	S	S	MS	S	MS	MS	MS	MS	MS	MS	MS

[a] Source: *Pshenitsa* (Wheat), p. 149, Kiev, "Urozhay" Publishing House, 1977.

R = Resistant
MS = Moderately Susceptible
S = Susceptible

rust occurred on winter wheat in Krasnodar Kray, the North Caucasus, the Ukraine, and the Nonchernozem Zone in 1973-76 and in 1980. CIA analysts estimated the loss in yield from the 1976 potential to be more than 8 million tons. In the Central Chernozem Zone, leaf rust infection is one of the most serious causes of yield reductions in winter wheat

The case is the same for spring wheats. In the Nonchernozem Zone leaf rust occurs almost every year. Severe outbreaks occurred in 1974 and 1976. When infection occurs early, losses of 30 to 50 percent can be sustained in affected areas. As of 1978, Saratovskaya 46 was the only spring wheat that possessed significant resistance to any of the wheat rusts

Most Soviet winter and spring wheat varieties are also susceptible to smut disease. Smut losses in the Central Region (Nonchernozem Zone) in recent years have been high and are estimated by the Soviets to average not less than 100,000 tons, more than 4 percent annually. Mironovskaya 808 is especially susceptible to a common type of smut called bunt. Larger-than-usual outbreaks of smut occurred in 1974 through 1976. More recently, large amounts of smut-contaminated grain have been delivered to the state from farms in the Ukraine (Ternopol, Poltava, Kirovo-- and Odessa Oblasts), Latvia, and Kazakhstan

Relatively few winter or spring wheat varieties are resistant to powdery mildew, the root rots, wheat scab, and Septoria disease. Powdery mildew is common in the USSR. Outbreaks of the disease have become increasingly severe in areas producing high-yielding varieties of winter wheat, particularly where fertilizer usage is high. The disease is also prevalent in spring wheat areas in the Volga Valley, Kazakhstan, the Southern Urals, Western Siberia, and Altay Kray. Root rots thrive where wheat is planted on the same areas in consecutive crop seasons and where minimum tillage occurs. Yield losses in spring wheat can run from 15 to 30 percent. In the wet year of 1976, losses exceeded 50 percent in many areas of the Nonchernozem Zone. Septoria disease occurs in parts of the Ukraine, Belorussia, the Baltic republics, and the Nonchernozem Zone, where sev reaks have led to losses of 15 to 20 percen.

Insect Problems. Soviet winter and spring wheats are highly susceptible to insect infestation particularly by the Hessian fly, the frit fly, wheat flies, sawflies, and the Sunn bug (Eurygaster). The Hessian fly is present in the European USSR, Siberia, and the Central Asian republics. It is most harmful in the Ukraine, and serious outbreaks can result in grain losses of 15 to 20 percent. The frit fly is most harmful in spring wheat regions. Wheat flies are a problem in both West and East Siberia, where they have been responsible for yield reductions of 20 to 30 percent. Sawflies occur in both the winter and spring wheat areas, and in recent years they have caused great damage to winter wheat in Krasnodar and Stavropol Krays. Eurygaster, which occurs in practically all grain-growing regions, may lower yields by 600 to 700 kilograms per hectare in addition to severely reducing the quality of wheat.

Breeding for Resistance

Diseases. The development of genetic resistance to various wheat diseases is one of the major problems of modern Soviet wheat breeding. The Krasnodar Institute of Agriculture has been foremost in developing disease-resistant varieties of winter wheat. In the period from 1960 to 1963, it initiated a research effort to introduce rust resistance into the Bezostaya line. As a result the high-yielding Avrora and Kavkaz varieties, which incorporated resistance to the then-predominant leaf rust races, were developed in 1967 and zoned in 1971. These varieties were widely touted as having complex resistance to all wheat rusts and to several other wheat diseases. They were rapidly adopted: 180,000 hectares were planted in 1971, 1.7 million hectares in 1972, and 3.8 million hectares in 1973.

In 1973, only two years after their introduction, the rust resistance of these two varieties was overcome by an extremely rapid epiphytotic appearance of a new aggressive biotype of race 77 of the leaf rust pathogen. As a result of the epiphytotic, winter wheat yields were reduced by 25 to 50 percent (figure 2). A leaf rust epiphytotic occurred again during the 1974-75 crop year in a wider area, reducing yields as much as 20 percent. As a result the area sown to Avrora was reduced by 1.4 million hectares for the 1975-76 crop year, during which another leaf rust outbreak occurred. These outbreaks were major setbacks from which the Soviet wheat-breeding program has not yet fully recovered. They resulted largely from the failure of breeders to use the rust research of Soviet plant pathologists. The continuing threat of leaf rust losses because of the lack of resistant varieties was made evident by yet another epiphytotic that occurred in 1980 in the North Caucasus, Ukraine, Central Chernozem Zone, and other winter wheat areas

Sov



Economic Regions

I Northwest	VII Ural	XIII Donets-Dnepr
II Central	VIII West Siberia	XIV South
III Central Chernozem	IX East Siberia	XV Transcaucasus
IV Volga-Vyatka	X Far East	XVI Kazakhstan
V North Caucasus	XI Baltic	XVII Central Asia
VI Volga	XII Southwest	XVIII Belorussia

Moldavia is administered as a separate economic region

Figure 1

Soviet Union: Frequency of Occurrence of Wheat Rust Epiphytotics

Average frequency of occurrence

1 out of every 2 years

1 out of every 3 years

1 out of every 5 years

1 out of every 10 years

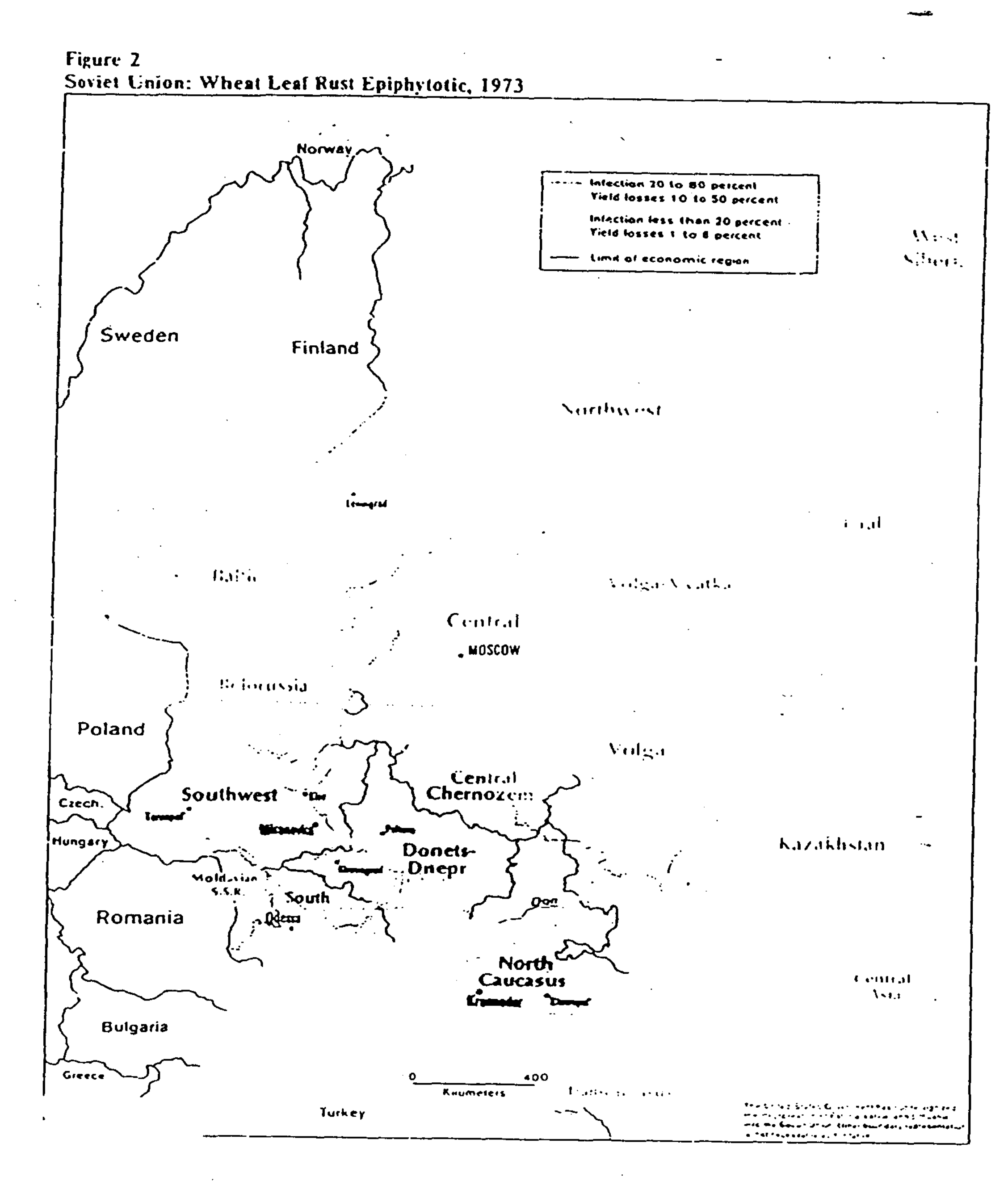
Stem Rust

Stripe Rust

Moldavian S.S.R.

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Figure 2
Soviet Union: Wheat Leaf Rust Epiphytotic, 1973



The wheat-breeding department at Krasnodar organized a special laboratory for insect and disease resistance in 1975. The laboratory's staff of plant pathologists and entomologists concentrates on the development of winter wheat resistance to rusts, powdery mildew, the root rots, and wheat scab disease, as well as to wheat sawflies and wheat leaf beetles. Rust nurseries have been set up to determine race composition and to detect new, dangerous races of rust. Genes determining reactions to specific races are being identified. A major goal is to develop winter wheat varieties with both nonspecific and multiple-race resistance to wheat rusts and other diseases by pyramiding genes. The laboratory emphasizes close integration of the work of breeders, pathologists, and entomologists.

The Krasnodar Institute of Agriculture has been at the forefront in organizing the direct participation of pathologists and entomologists with breeders in breeding for insect and disease resistance, and efforts are being made to implement a similar team approach in at least two other breeding centers. Since 1976 the Scientific-Research Institute of Agriculture for the Central Region of the Nonchernozem Zone, as evidenced by its published research, has been gradually developing a teamwork approach to winter wheat disease resistance, and the Zernogradka Selection Center (Volga region) is initiating a similar effort, according to [redacted] As of 1981, however, the majority of other wheat-breeding centers had not followed suit

Breeding for disease and insect resistance in spring wheat is even more seriously lacking in the USSR. Only a few sporadic efforts have been made over the last decade. Among the spring wheats grown in the major Soviet spring wheat area, only Saratovskaya 46 (zoned in 1977) has any significant resistance to rust diseases. For a more detailed assessment of Soviet wheat varieties developed since 1975, see appendix B

Lodging. Most Soviet wheat varieties are not sufficiently resistant to lodging. Yield losses of 6 to 15 percent because of lodging are common, and in wet years losses as great as 50 percent can occur in some areas. Lodging reduces grain protein content and results in a sharp deterioration in grain quality. Grain harvested from lodged areas cannot be used for seed purposes. In years in which conditions are favorable to lodging, as many as 10 to 15 million hectares of grain may be affected. The problem has been exacerbated in recent years by the increased use of fertilizer and by other agrotechnical improvements that cause the wheat plants to become excessively tall and topheavy. In written discussions of the breeding program, Soviet breeders cite the reduction of lodging as one of their more important breeding objectives

Other than semidwarf varieties introduced from abroad or developed in the USSR for irrigated planting, the winter wheat Bezostaya 1 and some of its derivatives are the best of the Soviet lodging-resistant wheats. Lodging is still a problem with Bezostaya 1, however, particularly when this variety is grown under conditions of intensive fertilization and irrigation. Bezostaya 1 is also susceptible to parasitic lodging caused by root rot fungi. The other major variety of winter wheat, Mironovskaya 808, is a tall plant (100 to 130 cm) and is thus also highly susceptible to lodging. The major spring wheat variety, Saratovskaya 29, is susceptible to lodging in years of abundant moisture

The Soviets emphasize that one of the most effective ways of increasing lodging resistance and productiveness is to develop short-stemmed varieties of wheat. For winter wheat in the USSR, they have determined that 80 to 90 centimeters (cm) is the optimal height. Hence, the relatively short-stemmed Bezostaya 1 (95 to 110 cm) has been used almost exclusively in crosses that attempt to increase the lodging resistance in Soviet winter wheats that are tall but otherwise possess desirable traits. This effort has produced Mironovskaya Jubilee, Ilichevka, Odesskaya 51, Priboy, and Severodonskaya. Most of these derivatives, while displaying increased lodging resistance, still remain more susceptible to lodging than their short parent Bezostaya 1

The Soviets have investigated the use of semidwarf varieties (65 to 75 cm) from Mexico and the United States to develop short-stemmed varieties of spring



and winter wheat. They have approved several foreign varieties for planting directly, primarily under irrigated conditions

Dwarf mutants have been developed by the Soviets and utilized to produce winter wheat varieties such as Polukarlikov 49. Most of these are true semidwarf varieties, developed primarily for the production of wheat under irrigation. Both winter and spring varieties resist lodging on irrigated fields and are highly responsive to increased fertilizer inputs. Their potential impact on total wheat production is minimal, however, since only a small percentage of the wheat in the USSR is produced on irrigated land-- 1.3 million hectares in 1980.

We consider it unlikely that semidwarf varieties, whether developed in the USSR or abroad, will be widely adopted for nonirrigated wheat-growing areas of the USSR. Although semidwarf wheats produce high yields under favorable water and fertility levels, they generally do not do so under conditions of environmental stress. Hence, it appears that the Soviets will opt for developing medium height (85 to 100 cm) grains with strong sturdy stems

Winterhardiness. The yield of winter wheat is heavily dependent upon the stand density of wheat remaining viable after a severe winter. Large winterkill losses are frequent in the USSR, averaging 15 to 20 percent; in severe winters as many as one-third of the plants perish. It is this factor that delimits the growing areas of the two major varieties. Mironovskaya 808 is planted primarily in the northern half of the winter wheat area because of its winterhardiness, while Bezostaya 1, lacking in winterhardiness, is planted in the southern areas (southern Ukraine, the Caucasus, and the southern Volga region). For a comparison of the winterhardiness of Soviet wheats, see table 6

The causes of injury and winterkill in overwintering wheat differ somewhat for each soil-climatic zone. In Belorussia, the Baltic republics, and the Nonchernozem Zone, plants most often die because of the reduction of oxygen under heavy snow. In the central chernozem oblasts, northwestern Ukraine, and the lower Volga, plant freezing frequently occurs because of insufficient snow cover. Ice crusting, which also reduces oxygen availability, causes the death of plants in the central regions of the Ukraine. In several of these regions, combinations of the above factors lead to winterkill

Table 6
Relative Winterhardiness of Winter Wheat Varieties Zoned for the North Caucasus and Rostov and Volgograd Oblasts

Variety	Winterhardiness
Mironovskaya 808	142
Krasnodarskaya 39	142
Mironovskaya Jubilee	136
Odesskaya 51	134
Rostovchanka	132
Donskaya Ostistaya	121
Bezostaya 1	100
Kavkaz	98
Avrora	98

Soviet efforts to overcome the lack of winterhardiness in lodging-resistant and high-yielding varieties have not been particularly successful. Soviet studies of the winterhardiness of 102 new winter wheat varieties zoned since 1969 concluded that none of them exceeded the winterhardiness of Mironovskaya 808 and Odesskaya 51. Actually, most of the new, high-yielding, and fertilizer-responsive varieties were deficient in this respect. Soviet breeders have concluded that a negative correlation exists between winterhardiness and high-yielding characteristics. Some US data on winterhardiness tends to support this conclusion

Drought Tolerance. A significant part of the USSR is frequently subjected to drought with the southern, southeastern, and eastern grain-growing regions most frequently affected. In these regions and in the southern winter wheat region, drought often occurs in combination with *sukhovey* (hot, dry winds) during the critical periods of flowering, filling, and ripening of grain





Soviet efforts to develop drought-tolerant varieties of wheat were given a higher priority in the 1960s and 1970s than those that focused on pest and disease resistance. In 1978 about 10 varieties of winter and spring wheat were drought resistant to some degree. These included Odesskaya 51, Priboy, Krasnodarskaya 39, Donetskaya 74, Dneprovskaya 775, and Saratovskaya 29 (first zoned in 1959). More recently, in 1979, Rostovchanka, Donskaya Ostistaya, and Severodonskaya (winter wheats) were also reported to be drought resistant and, under special tillage practices in the Volga region, somewhat tolerant of *sukhovey* conditions

A major and continuing problem in the USSR is the lack of wheat varieties that are both drought tolerant and responsive to high moisture in favorable years. Soviet breeders currently are trying to develop such varieties

Prospects
Few positive trends have been apparent in Soviet breeding research in recent years. The basic biological yield potential of the newer winter wheat varieties is similar to that of Bezostaya 1 and Mironovskaya 808, both first zoned for planting about two decades ago. The same is true for spring wheats: no new varieties have been developed to challenge the predominance of Saratovskaya 29. Furthermore, the susceptibility of both winter and spring wheats to disease and insects has not been significantly improved in the last 10 to 20 years. See appendix B for a more detailed assessment of the Soviet wheat varieties developed since 1975

Current Soviet breeding efforts thus will not have a major impact on wheat production in the near future (up to 1985). Yield increases during this time will largely reflect technological inputs--including fertilizer, plant protection chemicals, herbicides, growth retardants, and improved farming techniques—rather than biological inputs. Even if a major breakthrough in the development of higher yielding varieties should occur suddenly, which is extremely unlikely, the initial impact of these varieties on production would not be evident before 1985, and the full impact not before the late 1980s, because of the time required for testing, introduction, and seed multiplication

We estimate that the USSR could reduce its annual wheat losses from insects, diseases, and lodging by some 10 to 20 million tons within the next 10 years. The potential reduction reflects possible gains, not from the introduction of high-yielding varieties, but from the development of genetically improved wheat varieties with increased resistance to these biological and environmental hazards. To achieve these gains, however, the Soviets must overcome the numerous shortcomings that have plagued their wheat development program in the past

In the future the Soviets are likely first to give high priority to and make significant progress in breeding for insect and disease resistance, for this is the area of greatest deficiency. It is also the area of greatest promise because of the availability of sources of resistance in the Soviet germ plasm collection. In view of Soviet efforts to achieve high yields through increased fertilizer inputs, improvements in developing lodging-resistant varieties are also likely. Since Soviet wheat breeders have not adequately exploited the available wheat germ plasm of shorter and stronger stemmed wheats, it is believed that substantial progress can and probably will be made in this research area before the end of the decade



Appendix A

Vulnerability of Soviet Wheat

Genetic Diversity

In the USSR two varieties of winter wheat and one variety of spring wheat are predominant. Moreover, the germ plasm of these varieties has been extensively used to develop many other wheats of lesser consequence.

The predominant winter wheats are Bezostaya 1 (zoned in 1957) and Mironovskaya 808 (zoned in 1963). Together they accounted for 50 percent of the winter wheat sown in 1980. The third-ranking winter wheat, based on area planted, is Odesskaya 51, which has been sown on about 14 percent of the total USSR winter wheat area since 1978. Ranking fourth is Severodonskaya. In 1980 it was planted on 1.27 million hectares, 6 to 7 percent of the total sown winter wheat area.

Both Bezostaya 1 and Mironovskaya 808 have been utilized widely in the development of new varieties of winter wheat (tables 7 and 8). Since 1959, 78 varieties have been developed from crosses involving Bezostaya 1 or its initial variety, Bezostaya 4. At least 18 of these have been zoned since 1975. In the past 17 years, Mironovskaya 808 has been utilized in crosses to develop about 40 varieties of winter wheat; at least nine crosses were with Bezostaya 1. Four of the 40 have been zoned since 1975.

Saratovskaya 29 (zoned in 1957) has dominated the total area planted to common spring wheat since 1970, when it was planted on some 16.7 million hectares. During the period from 1975 to 1980, nearly 96 percent of the spring wheat fields of Kazakhstan were planted to Saratovskaya 29. In one Kazakhstan oblast (Kustanay), Saratovskaya 29 has been under cultivation for more than 22 years.

Saratovskaya 29 also has been used extensively as one of the parents of at least a dozen other spring wheats, of which five have been zoned since 1975. It is estimated that some 60 percent of nondurum spring wheat grown in the USSR contains the germ plasm of Saratovskaya 29.

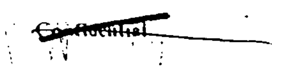
During the period of 1976-80, about 35 new varieties of spring wheat were zoned. By 1979 some 25 of them were sown on nearly 10 million hectares, 25.5 percent of the total area sown to spring wheat in the USSR that year. Thus, even though Saratovskaya 29 remains the major spring wheat, much of the spring wheat area is undergoing change in its varietal makeup. The impact of any one of the new varieties on total spring wheat production is limited, however, because of the number of varieties involved and the small area occupied by each of them.

The current basic durum spring wheat in the USSR is Kharkovskaya 46, which was first released in 1957. It accounts for about 80 to 90 percent of all of the durum wheat produced in the USSR. The total area planted to durum wheat, once 3 to 4 million hectares, has fallen in recent years to 1.5 to 2.0 million hectares.

Genetic Vulnerability

Plant breeding improvements frequently lead to greater genetic uniformity, and this, in turn, produces a genetic environment that favors the development of destructive races of pathogens or strains of insects. Varieties that are genetically uniform are also usually less able to cope with severe climatic stress. Thus, the extended dominance of Bezostaya 1 and Mironovskaya 808 among the winter wheats and Saratovskaya 29 among the spring wheats would appear to render each of them vulnerable to possible genetic assault.

There is little evidence to suggest a major Soviet breeding effort to reduce genetic uniformity in any of the major growing areas. At present about 90 percent of the zoned Soviet winter wheat varieties contain the germ plasm of Bezostaya 1 or Mironovskaya 808, or both. More than 70 percent of the number of prospective winter wheat varieties accepted for state testing during the 1970s were developed from one or both of



Variety and Year	Other Germ Plasm Used
Polyet (1971)	Veselopodolyanskaya 682
Donetskaya 74 (1976)	Lutescens 238
Kharkovskaya 63-1-3 (1969)	Lutescens 238
Krupnokolosaya (1974)	Lutescens 238
Krasnodarskaya 39 (1972)	Saratovskaya 3
Polukarlik 1 (1974)	Saratovskaya 3
Predgornaya 2	Erythrospermum 315-h-60
Skorospelka 35	Erythrospermum 315-h-60
Lutescens 4 (Intensivnaya) (1978)	Kazakhstan 126 and Kirgizskaya 100
Buryatskaya 34 (1977)*	Spontaneous hybrid with Bezostaya 1
Dneprovskaya 775 (1976)	Lutescens 230, Veselopodolyanskaya 499 and 485
Erythrospermum 127 (1977)	Vygodyanskaya 2
Polukarlikova 49 (1979)	Mutant (Krasnodar Karlik) x Mironovskaya 808
Belotserkovskaya 47 (1981)	Belotserkovskaya 198 and 21
Zaporozhskaya Ostistaya (1980)	Skorospelka L-1, Zaporozhskaya 4
Khersonskaya 153 (1979)	Dneprovskaya 537
Tezpishar (1980)	Grekum 646
Kharkovskaya 81	Lutescens 172
Belotserkovskaya 177 (1979)	(Belotserkovskaya 198 x Belotserkovskaya 23)
Novostepnyachka 50 (1974)	Odesskaya 29
Kazakhstan 50 (1974)	Odesskaya 29
Zhana Zhulduz (1974)	Odesskaya 29
Polesskaya 70 (1974)	Winter rye (Tatsinskaya Golubaya) endosperm
Polesskaya 71 (1974)	Winter rye (Tatsinskaya Golubaya) endosperm
Orbita (1974)	Kanred Fulcaster (US) x Ukrainka



Table 7 (continued)

Variety and Year	Other Germ Plasm Used
Dneprovskaya 521 (1971)	(Ukrainka x Elimus)
MD 2387 (1969)	Lutescens 62
MD 2328 (1969)	Pionerka
Krasnodarskaya 1 (1973)[b]	Krasnodarskaya 362
Mechta (1975)[a]	Krasnodarskaya 362
Donskaya Ostistaya (1975)	Local variety 272/59
Severokubanskaya 43 (1970)	Lutescens 329
Soyuz 50 (1974)	Mironovskaya 808
Using Bezostaya 4	
Mironovskaya Jubilee 50 (1971)	Mironovskaya 808
Ilichevka (1974)	Mironovskaya 808
Dan'shinskaya (1976)	Mironovskaya 808
Stepova (1967)	Odesskaya 16
Chernomorskaya 406/70 (1973)	Odesskaya 16
Chernomorskaya 468/70 (1973)	Odesskaya 16
Chernomorskaya 478/70 (1973)	Odesskaya 16
Zernogradskaya 4 (1965)	Odesskaya line
Zernogradskaya 5	Odesskaya line
Gloriya (1972)	(Odesskaya 12 x Osetinskaya x Novoukrainka 84) x (Ukrainka 246 x Erythrospermum 126)
Skorospelka 35 (1959)	Lutescens 9411
Rannaya 12 (1975)	Skorospelka 3
Kharkovskaya 38 (1974)	Erythrospermum 88
Kharkovskaya 81 (1974)	Lutescens 172
Lutescens 259 (1975)	Tambovchanka
Dnestrovskaya 25 (1977)	Wheat - Agropyron (Pshenichno-pyreynoi) hybrid 186

[a] Spring wheat.
[b] Spring durum wheat

Table 8
Partial Listing of Soviet Wheat Varieties Developed From Mironovskaya 808 Germ Plasm

Variety and Year	Other Germ Plasm Used
Mironovskaya Yarovaya (1978)[a]	Selection from Mironovskaya 808
Mironovskaya 25 (1980)	"
Mironovskaya Improved	"
Mironovskaya Jubilee (1971)	Bezostaya 4
Akhtyrchanka (1978)	Bezostaya 1
Severodonskaya (1977)	"
Ilichevka (1974)	"
Prikumskaya 36 (1976)	"
Kharkovskaya 68 (1974)	"
Soyuz 50 (1974)	"
Kharkovskaya 63 (1969)	"
Kharkovskaya 159 (1968)	Selection from Mironovskaya 808
Dan'shinskaya (1976)	Bezostaya 4
Yantar (1962)	Pervenka
Belgorodskaya 5 (1977)	Heine VII (foreign variety)
L'govskaya 47 (67-47) (1974)	(L'govskaya 2 x line 58-144)
Sibiryachka 4 (1976)[a]	(Sibiryachka 2 x Saratovskaya 29)
Omskaya 1 (1972)	Saratovskaya 29
Omskaya 6 (1973)	"

[a] Spring wheat.

these varieties. It is estimated that at least 60 percent of the present Soviet spring wheat varieties contain Saratovskaya 29 germ plasm. Furthermore, there have been no spring wheat varieties developed to compete successfully with Saratovskaya 29 over the last 15 years.

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Appendix B

Assessment of Soviet Wheat Varieties

Wheat approved for production in the USSR includes 60 to 70 varieties of winter wheat and 100 or more varieties of spring wheat, including durum. As new varieties of wheat are tested and approved, others may be dropped from the approved list. On the average, since 1975, about seven new varieties of winter and about seven of spring wheat have been approved annually.

Winter Wheat

During 1976-81 at least 36 newly developed winter wheat varieties were approved for planting (table 9). Only five of these stand out appreciably from the rest. Severodonskaya (derived from a Bezostaya 1 x Mironovskaya 808 cross) and Akhtyrchanka (derived from a Mironovskaya 808 x Bezostaya 1 cross) are reported to be similar to Mironovskaya 808 in winter resistance and in their tendency to lodge. The other three, designated for irrigated planting, include two semidwarf varieties, Polukarlikova 49 (bred with a dwarf mutant of Bezostaya as one parent) and Odesskaya Polukarlikova, and Khersonskaya 153. All are reported to be fairly winter resistant, lodging resistant, responsive to fertilization, and susceptible to leaf rust disease. On the basis of evidence thus far available, it appears that there have been no major advances in the development of new winter wheat varieties since 1975.

Spring Wheat

Thirty-five Soviet-developed varieties of spring wheat, including durum wheats, were approved for planting during 1976-81 (table 10). At least 10 of these were derived by crossing Saratovskaya 29 with some other strain of wheat. Three of the 10 were produced by crossing Bezostaya 1 with Saratovskaya 29 to achieve a shorter stemmed wheat. While none of the new varieties developed up to 1980 appear to be capable of seriously challenging Saratovskaya 29 in areas where it is normally planted, four of them merit some discussion:

Omskaya 9 was approved in 1979 for North Kazakhstan, Omsk, and Kokchetav Oblasts, and Krasnoyarsk Kray. A cross between Bezostaya 1 and Saratovskaya 29, it reportedly yields better than Saratovskaya 29 in both wet and dry years and is resistant to stem rust, drought, and lodging. As of 1979 it was planted on 19,300 hectares.

Tselinnaya 20 and 21 were approved in 1978 and 1979 respectively. Tselinnaya 20 is zoned for Altay Kray, Omsk, Chelyabinsk, and East Kazakhstan Oblasts. It is believed to be derived from the cross of a US durum (Lakota) with Saratovskaya 29. The derivation of Tselinnaya 21 is not known, but it may be a selection from Tselinnaya 20 or the result of a cross of Saratovskaya 29 or Tselinnaya 20 with another variety. It was approved for Semipalatinsk, Tselinograd, and Kokchetav Oblasts. Both are reported to outyield Saratovskaya 29, which they equal in grain quality and in drought resistance. As of 1979 about 88,500 hectares were planted to Tselinnaya 20 and 22,000 hectares to Tselinnaya 21.

Saratovskaya 46 was approved in 1977 for Saratov Oblast and in subsequent years for Volgograd, Kuybyshev, Ulanovsk, Kustanay, Chelyabinsk, and Voronezh Oblasts. It may be the result of a cross of Saratovskaya 29 with Saratovskaya 36 or 38. Its short stature (65 to 80 cm) suggests that the other parent may have been a foreign short-stem variety. Resistant to lodging and with good drought tolerance, it is moderately susceptible to leaf rust. While it is unlikely to compete with Saratovskaya 29, it can compete with Saratovskaya 38 and 36 in the Volga region. In 1979, however, only 41,000 hectares of Saratovskaya 46 were planted.

Feedwheat

The USSR, already using a good portion of its wheat crop (40 percent in recent years) for livestock and poultry feeding, has considered developing feedwheats for use in Siberia and certain other selected areas.[*] Efforts to date, however, have been minimal.

[*] Feedwheats, which are high in protein, give 15 to 20 percent higher yields than breadwheats, but the grain does not meet breadwheat quality standards.

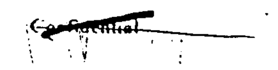


Table 9
Soviet Winter Wheat Varieties Approved for Zoning Since 1975

Year	Name of Variety	Originator	Location Where Zoned
1976	Krasnodarskaya 46	Krasnodar NII of Agriculture	Northern Krasnodar Kray
	Donetskaya 74	Donets State Oblast Experiment Station	Donets Oblast
	Prikumskaya 36	Budennovsk State Experiment-Selection Station	Stavropol Kray
	Krasnovodopadskaya 210	Krasnovodopad State Selection Station	Kirgizia and semiarid Kazakhstan
	Leukurum 3	Uzbek NII of Dryland Farming	Three oblasts in Uzbekistan
	Dneprovskaya 775	All-Union NII of Corn	Dnepropetrovsk Oblast
1977	Severodonskaya	Zernograd Selection Station	Rostov Oblast
	Belgorodskaya 5	Institute of Animal Husbandry, Central Chernozem	Belgorod Oblast
	Erythrospermum 127	Odessa Agricultural Institute	Moldavian SSR
	Dnestrovskaya 25	Moldavian NII of Field Crops	Moldavian SSR
1978	Akhtyrchanka	Ivanov Experiment-Selection Station	Cherkassk and Sumsk Oblasts
	Zarya	NII of Agriculture, Central Region, Chernozem Zone	
	Vatan *	Central Asian Selection Center	
	Lutescens 4 (Intensivnaya)	Kirgiz NII of Farming	Kirgiz SSR
	Ostrastayushchaya 38	Main Botanical Garden, Academy of Sciences USSR	Belgorod and Gorkiy Oblasts
	Starke II	Sweden	
1979	Polukarlikov 49	Krasnodar NII of Agriculture	Southern Ukraine (irrigation)
	Khersonskaya 153	Ukrainian NII of Irrigated Farming	Southern Ukraine (irrigation)
	Belotserkovskaya 177	Belotserkov Experiment-Selection Station	Zakarpatsk Oblast
	Gurgyana 1	Azerbaijan NII of Farming	Azerbaijan SSR
	Mugan	Azerbaijan NII of Farming	Azerbaijan SSR
	Erythrospermum 80	Kirgiz NII of Farming	Kirgiz SSR
1980	Odesskaya Polukarlikova	All-Union Selection-Genetics Institute, Odessa	Odessa Oblast
	Zaporozhskaya Ostistaya	Zaporozh Agricultural Experiment Station	Zaporozh Oblast (irrigation)
	Dneprovskaya 846	All-Union NII of Corn	
	Mironovskaya 25	Mironovka NII Selection and Seedgrowing of Wheat	
	Tezpishar	Uzbek NII of Grain	Tashkent Oblast
	Severokubanka	Krasnodar NII of Agriculture	Rostov Oblast (irrigation)
	Zernogradka 2	Zernograd Selection Station	
1981	Kharkovskaya 81	Ukrainian NII of Plant Industry	
	L'govskaya 77	L'gov Experiment-Selection Station	
	Ivanovskaya 12	Ivanov Experiment-Selection Station	
	Belotserkovskaya 47	Belotserkov Experiment-Selection Station	Kiev Oblast
	Bogarnaya 56		
	Tarasovskaya		
	Niva *	Omsk Agriculture Institute	

* Previously zoned as spring wheat



Table 10
Soviet Spring Wheat Varieties Approved for Zoning Since 1975

Year	Name of Variety	Originator	Location Where Zoned
1976	Kinel 30	Kinel State Selection Station	Kuybyshev Oblast
	Saratovskaya 44	NII of Agriculture of Southeast	Altay Kray and Saratov, Volgograd, Kuyibyshev, Chelyabinsk, and Voronezh Oblasts
	Sayanskaya 55	Khakassk Agricultural Experiment Station	Krasnoyarsk Kray (irrigation)
	Sibiryachka 4	Siberian NII of Agriculture	Omsk Oblast
	World Seeds 1877	US	Saratov Oblast (irrigation)
1977	Buryatskaya 34	Buryat Selection Station	Buryat ASSR and Chitinsk Oblast
	Lutescens 47	Blagoveshchensk Agriculture Institute	Amur Oblast
	Niva	Omsk Agriculture Institute	Omsk Oblast
	Primorskaya 14	Primorsk Agricultural Experiment Station	Primorsk Kray
	Saratovskaya 46	NII of Agriculture of Southeast	Saratov Oblast
1978	Volzhanka		
	Luganskaya 4	Voroshilovgrad Oblast Agricultural Experiment Station	Voroshilovgrad Oblast and Altay Kray
	Mironovskaya Yarovaya	Mironovka NII Selection and Seedgrowing of Wheat	Overseeding in winter, Ukraine
	Orenburgskaya 1	NII of Agriculture of the Southeast	Orenburg Oblast
	Rannyaya 73	Ukraine NII of Farming	Overseeding in winter, Ukraine
	Ruso		
	Tselinnaya 20	All-Union NII of Grain Farming	Altay Kray, Omsk, East Kazakhstan, and Chelyabinsk Oblasts
	Erythrospermum 24	Krasnodar NII of Agriculture	Ulyanovsk Oblast
1979	Bezenchukskaya 129	Kuybyshev NII of Agriculture	Kuybyshev Oblast
	Kutulukskaya	Kinel State Selection Station	Kuybyshev Oblast
	Almaz (durum)	Siberian NII of Agriculture	N. Kazakhstan and Omsk Oblasts
	Omskaya 9	Siberian NII of Agriculture	Krasnoyarsk Kray, Omsk, Kokchetav, and North Kazakhstan Oblasts
	Lutescens 57	Karabalyk Agricultural Experiment Station	Novosibirsk Oblast
	Kazakhstanskaya 3	Kazakh NII of Farming	Kazakhstan
	Shadrinskaya	Kurgan NII of Grain Farming and Shadrinsk Agricultural Experiment Station	Kurgan Oblast
	Karagandinskaya 2	Karagandinsk Agricultural Experiment Station	Karagandinsk and Pavlodar Oblasts
	Tselinnaya 21	All-Union Institute of Grain Farming	Semipalatinsk, Tselinograd, and Kokchetav Oblasts
	Uralskaya Jubilee	Uralsk Oblast Experiment Station	Uralsk Oblast





Table 10
Soviet Spring Wheat Varieties
Approved for Zoning Since 1975 (continued)

Year	Name of Variety	Originator	Location Where Zoned
1980	Bezenchukskaya 139	Kuybyshev NII of Agriculture	Kuybyshev Oblast
	Sredneuralskaya	Krasnoufimsk Selection Station	Sverdlovsk Oblast
	Sibakhovskaya 3 Altayka	Omsk Agricultural Institute	Omsk Oblast
1981	Priobskaya	Siberian NII of Plant Industry and Selection	Novosibirsk Oblast
	Rossiyanka	South Ural NII of Farming	Urals
	Irtyshanka	Siberian NII of Agriculture	Novosibirsk Oblast

Thus far the Soviets are known to have tested feedwheat obtained from the United States, as well as a feedwheat reportedly developed at the Mironovka station. No further information on these two varieties is available.

A winter wheat Kormovaya 30, was submitted for testing in 1979. It is possible that it could be a fodder wheat, a wheat in which the whole plant is used for green fodder. A small percentage of Soviet winter wheat is grown for that purpose. If Kormovaya 30 is a feedwheat, it will undoubtedly undergo several more years of testing.

In 1980 the Soviets reported that the All-Union Selection and Genetics Institute had developed a feedwheat called Odesskaya Zernofurazhnaya. In tests it exceeded the yield of Bezostaya 1 by 32 percent, and the grain contained 15.5 percent protein. There is no evidence at this time, however, to suggest that this wheat has been approved for planting.

